RLP-ALG1B · RLP Algebra 1B — Functions, Exponential and Quadratic Models

Unit 4: Quadratic Equations

Practice Workbook. The same problems, in the same order, as the Practice sections of the online lessons.

Name _____ Period _____

Lesson 4.1 — Solving Quadratics by Square Roots and Factoring

FLUENCY

1. Solve: $x^2 + 12x + 32 = 0$

2. Solve: $x^2 - 14x + 49 = 0$

3. Solve: $x^2 - 7x = 0$

4. Solve: $x^2 + 8x = 0$

5. Solve: $x^2 - 12 = 0$

6. Solve: $x^2 - 36 = 0$

7. Solve: $x^2 - 3 = 0$

8. Factor: $x^2 - 3x - 18$

9. Factor: $x^2 - 16$

10. Factor: $x^2 - 4$

11. Factor: $x^2 - 10x + 9$

APPLICATION

12. A community-garden plot is 5 m longer than it is wide and has area 84 m^2. Find its dimensions.

13. A poster is 3 cm taller than it is wide with area 180 cm^2. Find its dimensions.

14. A ball's height is $h = -16t^2 + 64t$ feet. When is it on the ground, and when is it 48 feet high?

CHALLENGE

15. Write a quadratic with zeros -3 and 5 and y-intercept 30.

REVIEW

16. A quantity starts at 15,000 and grows by 3% each year. Write a model and find its value after 14 years, to the nearest whole number.

17. Find the slope of the line through $(-1, -3)$ and $(1, 9)$.

Lesson 4.2 — Completing the Square

FLUENCY

1. Complete the square to write $y = x^2 + 4x + 3$ in vertex form, and give the vertex.

2. Complete the square to write $y = x^2 + 4x - 5$ in vertex form, and give the vertex.

3. Complete the square to write $y = x^2 + 8x + 20$ in vertex form, and give the vertex.

4. Complete the square to write $y = x^2 - 8x + 23$ in vertex form, and give the vertex.

5. Solve $x^2 + 8x - 9 = 0$ by completing the square.

6. Solve $x^2 - 6x + 2 = 0$ by completing the square.

7. Solve $2x^2 + 8x - 10 = 0$ by completing the square.

APPLICATION

8. Find the minimum of $f(x) = x^2 - 10x + 31$ by completing the square.

9. Rewrite $h(t) = -4.9t^2 + 19.6t + 1.5$ in vertex form and state the maximum height.

10. Rewrite $R(p) = -25p^2 + 800p$ in vertex form.

CHALLENGE

11. Complete the square on $x^2 + bx + c$ in general and use the result to find the minimum of $x^2 + 7x + 10$.

REVIEW

12. Find the inverse of $f(x) = 6x$.

13. An arithmetic sequence has first term 5 and common difference -1. Write an explicit formula, then find term 16 and the sum of the first 16 terms.

Lesson 4.3 — Deriving the Quadratic Formula, and What Its Solutions Can Be

FLUENCY

1. Solve: $2x^2 - 5x + 5 = 0$

2. Solve: $4x^2 + 8x - 7 = 0$

3. Solve: $3x^2 - 7x - 4 = 0$

4. Solve: $x^2 - 3x + 7 = 0$

5. Find the discriminant of $x^2 + 4x + 4 = 0$ and the number of real solutions.

6. Find the discriminant of $x^2 + x + 1 = 0$ and the number of real solutions.

7. Find the discriminant of $2x^2 - 5x - 3 = 0$ and the number of real solutions.

8. Find the discriminant of $3x^2 - 6x + 2 = 0$ and the number of real solutions.

APPLICATION

9. For $h(t) = -4.9t^2 + 14.7t + 2$ (Lesson 3.4), find the landing time with the quadratic formula.

10. Does the same ball ever reach 15 m? Use the discriminant.

11. Solve $x^2 - 4x + 13 = 0$ and write the solutions as $a \pm bi$.

CHALLENGE

12. Prove that $2 + \sqrt{3}$ is irrational (you may use that $\sqrt{3}$ is irrational). Then show that the sum of two irrational numbers can be rational.

REVIEW

13. A quantity starts at 8,000 and decreases by 12% each year. Write a model and find its value after 9 years, to the nearest whole number.

14. Solve the system: $-4x + y = 18$ and $-4x - 2y = 36$

Lesson 4.4 — Where Paths Cross: Linear-Quadratic Systems and Choosing a Method

FLUENCY

1. Solve: $x^2 - 7x + 6 = 0$

2. Solve: $x^2 + 4x + 3 = 0$

3. Solve the system $y = x^2$ and $y = x + 6$.

4. Solve the system $y = x^2 - 2x$ and $y = 2x - 4$.

5. Solve the system $y = x^2 + 1$ and $y = x - 1$.

6. Solve the system $y = 4 - x^2$ and $y = 2x + 1$.

APPLICATION

7. A fountain jet follows $y = -0.5x^2 + 4x$ and a ramp follows $y = x$ (feet, illustrative). Where does the water land on the ramp?

8. For $R(p) = p(600 - 20p)$, which prices give revenue \$4,320?

9. The ball $h(t) = -4.9t^2 + 14.7t + 2$ passes a drone hovering at 10 m. When is the ball above the drone?

CHALLENGE

10. For which b does the line $y = x + b$ touch the parabola $y = x^2 - 4x + 3$ exactly once?

REVIEW

11. Write the equation, in slope-intercept form, of the line through $(-4, -25)$ and $(2, -1)$.

12. For the data 4, 10, 11, 11, 13, 16, 29, 29, 37, 37: find the mean, median, range and interquartile range. (Find the quartiles as the medians of the lower and upper halves, leaving out the overall median when the count is odd.)

Unit 4 checkpoint

1. Solve $x^2 - 5x - 14 = 0$.
   A. $x = 7$ or $x = -2$
   B. $x = -7$ or $x = 2$
   C. $x = 14$ or $x = -1$
   D. $x = 5$ or $x = -14$
2. True or false: $(x - 3)^2 = 25$ has only the solution $x = 8$.
3. $x^2 + 6x +$ _____ $= (x + 3)^2$.
4. Vertex form of $x^2 - 8x + 10$?
   A. $(x - 4)^2 - 6$
   B. $(x - 4)^2 + 10$
   C. $(x + 4)^2 - 6$
   D. $(x - 8)^2 - 54$
5. $2x^2 + 12x + 5 = 2(x + 3)^2 -$ _____.
6. The discriminant of $x^2 + 5x + 7$ is -3. The equation has…
   A. no real solutions
   B. one real solution
   C. two real solutions
   D. infinitely many
7. For $2x^2 - 3x - 4 = 0$, the discriminant is _____.
8. $x^2 + 2x + 5 = 0$ has solutions…
   A. $-1 \pm 2i$
   B. $1 \pm 2i$
   C. $-1 \pm 4i$
   D. $-2 \pm i$
9. True or false: The sum of a rational number and an irrational number is irrational.
10. Solve $y = x^2$ and $y = 2x + 3$.
    A. (3, 9) and (−1, 1)
    B. (3, 9) only
    C. (−3, 9) and (1, 1)
    D. no solution
11. The mural border $(w + 18)(w - 2) = 0$ is _____ feet wide.

12. True or false: Dividing $x^2 = 5x$ by x finds every solution.